

**Los Alamos National Laboratory  
Stormwater Sampling  
Frequently Asked Questions**

**1. Where are water samples collected at LANL for rain runoff events?**

Runoff samples are collected when a rainfall event causes flow in a drainage that crosses the Laboratory's eastern or western boundaries. There are about 63 gaging stations equipped with automated sampling equipment located throughout the Laboratory. As shown in the accompanying figure, all of the runoff sampling stations are within, or close to, the Laboratory boundary. Runoff samples have been collected by LANL for 20 years and the results of analysis of the samples are reported in the yearly Environmental Surveillance Report. The Los Alamos National Laboratory Environmental Surveillance Reports are available on the web at <http://www.esh.lanl.gov/envireports.htm> or from the National Technical Information Service, US Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22616. A complete set of the reports is also available at the University of California Public Reading Room in Los Alamos.

**2. How are runoff samples collected?**

Samples were collected by two different methods: automated sampling equipment and manual. Automated sampling equipment is set up to collect water at specific intervals throughout the flow. Automated samplers are used to ensure that the water from the entire flow event is collected. Because many of the storm events are short-lived, the automated equipment provides the only means of sampling the runoff at remote sites. Manual sampling is done by a sampling crew that dips a sample bottle into the flow and fills it with the stormwater to collect the sample. Manual samples are collected as a back up to the automated sampler.

**3. What do automated sampling stations look like?**

A picture of a typical station is shown here. Gaging stations are equipped with portable automatic samplers, ultrasonic flow level sensors, radio or cellular telemetry, 12-volt batteries, Parshall flumes, weir plates, and stilling wells. The flume, weir, stilling well, and flow level sensors are used to measure the height of the water. The flow level sensors record the height of the water through an event and sends the data to a computer through the radio or cellular telemetry. The automated samplers consist of a carousel that holds sample bottles and an electronic control system. The electronic control system can be set to fill bottles from a flow at time intervals, for example, every 5 minutes. The carrousel rotates the bottles around on the set time interval so that each bottle contains water from a separate time interval of flow. The batteries are required to power the sampler, flow sensor, and telemetry.

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Drainage channel with Parshall flume, flow sensor probe and an automatic sampler.

**4. Why are there "filtered" and "unfiltered" samples?**

Stormwater samples are processed prior to submittal to an analytical laboratory. Some of the water is filtered, removing the sediment suspended (particulates) in the water. This is done to measure the concentration of constituents actually dissolved in the water. The filtered samples represent clear water that a person might drink. The rest of the water is submitted to the analytical laboratory unfiltered, so the measured concentration includes both dissolved and suspended constituents. The unfiltered sample measures the total contaminants moving in the stream. It is unlikely that animals or humans would drink the water containing the high sediment loads present in the unfiltered samples. The concentration of the constituents that would be present in the suspended sediment alone can be calculated using the total suspended sediment (TSS) measurement. The concentration in suspended sediment is representative of part of what would be left in the channel when the sediments settle out after the water stops flowing.

**5. How are these samples analyzed?**

Samples are sent to a DOE approved commercial analytical laboratory for analysis. The samples are analyzed for radionuclides, metals, general inorganic compounds, volatile organic compounds, semi-volatile organic compounds, and total suspended sediment. Most of the analyses are performed using methods specified by the US Environmental Protection Agency. The commercial laboratory analyzes the samples in accordance with the "Los Alamos National Laboratory Sample Management Office Statement of Work for Analytical

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Services and the ESH-18 Addendum." Analyses are performed in three general categories: inorganic, organic, and radiochemistry. Runoff samples are analyzed by approved methods listed in 40 CFR 136.3, "*Guidelines Establishing Test Procedures for the Analysis of Pollutants, Identification of Test Procedures*", provided there exists an approved method for the analyte requested. LANL has also requested and received permission from EPA to use modernized methods for metals and anion analysis. These methods were originally published in *Methods for Chemical Analysis of Water and Wastes* (EPA-600/4-79-020) and have been revised in the EPA publication *Methods for the Determination of Metals* (EPA-600/4-91/010 and Supplement I, EPA/600/R-94-111, May 1994) and *Inorganic Chemicals in Environmental Samples* (EPA/600/R-93-100). The specific methods published in these documents that LANL has obtained permission to use are:

200.7 - "Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry"

200.8 - "Determination of Trace Elements in Water and Wastes by Inductively Coupled Plasma-Mass Spectrometry"

200.9 - "Determination of Trace Elements by Stabilized Temperature Graphite Furnace Atomic Absorption Spectrometry"

300.0 - "Determination of Inorganic Anions by Ion Chromatography"

We have chosen to use these methods to improve data comparability between multiple programs conducting studies at LANL.

Analytes for which no method exists in 40 CFR 136.3 are measured by alternate methods, including:

- high explosives by SW-846 Method 8330
- petroleum hydrocarbons by SW-846 Method 8015 (modified)
- LANL-approved radiochemical methods for the measurement of radioisotopes
- Or, as documented in relevant permits.

**6. How are locations for collecting run off samples from a storm event determined?**

Samples are generally collected by our automated runoff samplers. These samplers collect a sample whenever a significant flow occurs at the station. Because we are experiencing much higher flows than before the fire we have also formed two teams to collect samples manually.

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Manual runoff samples are collected from canyons where stormwater flow crosses the upstream or downstream (eastern) Laboratory boundary. During significant rainfall events, the Stormwater Team is dispatched to observe the canyons along the eastern boundary. In the June 2 event, only Los Alamos Canyon had flow that crossed the eastern boundary. In subsequent events, flow has been sampled in multiple canyons.

**7. In the sampling data, what does the "uncertainty" reported for the measurements mean?**

For individual measurements of radioisotopes, the uncertainties reported are one standard deviation. The standard deviation is estimated from the propagated sources of analytical error. This gives us an idea of measurement precision.

**8. Why are negative results reported for radiochemical measurements?**

Measurements of radiochemical samples require that analytical or instrumental backgrounds be subtracted to obtain net values. Thus, the net values are sometimes obtained that are lower than the minimum detection limit of the analytical technique. Consequently, individual measurements can result in values of positive and negative numbers. Although a negative value does not represent a physical reality, a valid long-term average of many measurements can be only be obtained if the very small and negative numbers are included in the population calculations.

**9. Several of the sample results are above the "DOE Derived Concentration Guideline." What does a DOE DCG mean?**

DOE's Derived Concentration Guides (DCG) are reference values for conducting radiological environmental protection programs at operational DOE facilities and sites. The application of DCGs is described in the "Environment, Safety and Health Reporting Manual (DOE M 231.1-1). The DCGs are based on consumption of two liters of water per day for 365 days per year. The public dose DCG values are based on a committed effective dose equivalent of a maximum of 100 mrem for the radionuclide taken into the body by ingestion during one year. The DCG for drinking water is based on a criterion of 4 mrem per year and is 4% of the public dose values for ingestion. It is unlikely that anyone would drink the muddy water associated with stormwater events. It would not be possible to drink the water from stormwater events for more than a few days per year since the events are infrequent and short lived. For these reasons comparison to DCGs is a very conservative evaluation of the potential for health impacts from stormwater.

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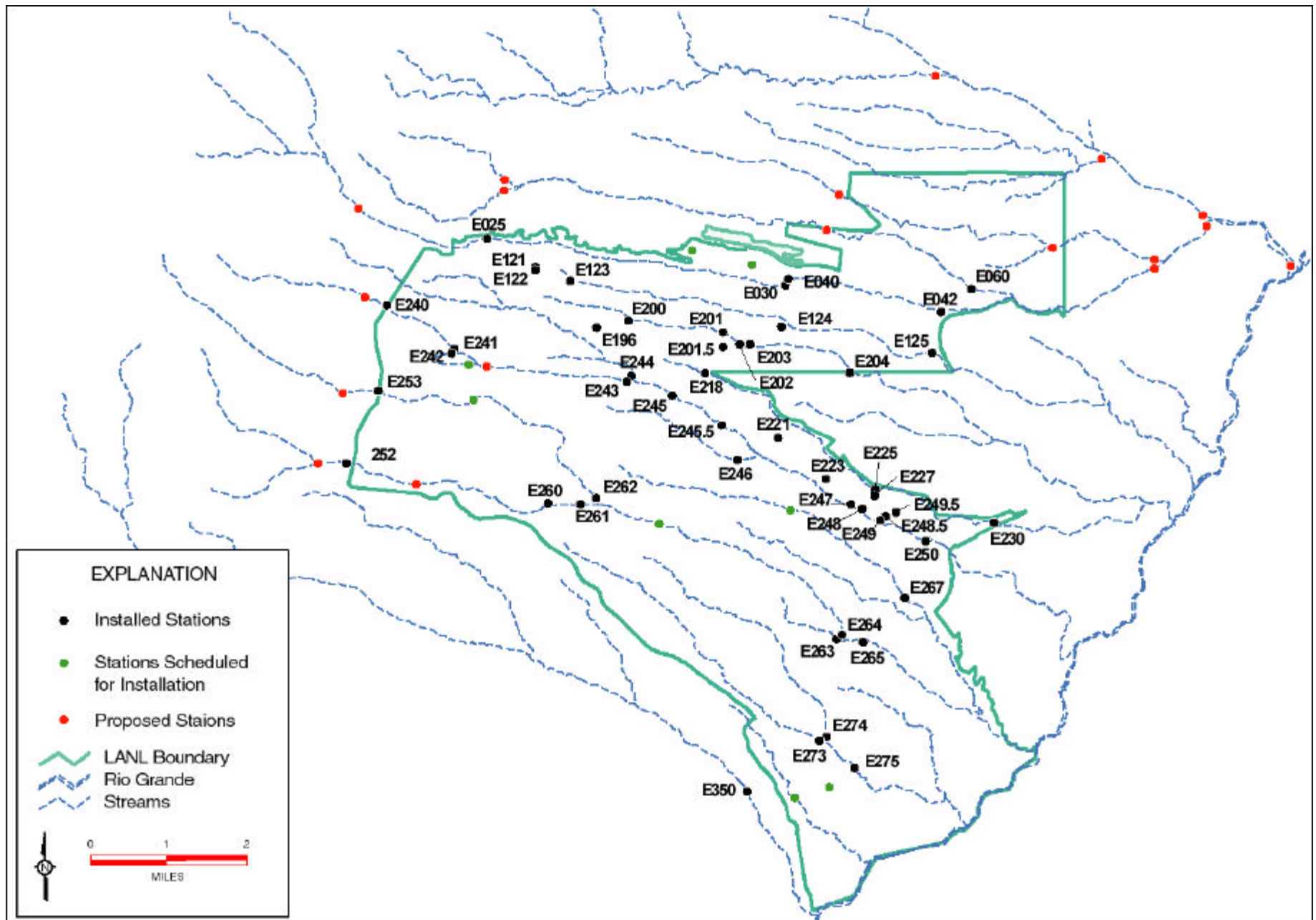
**10. What are "background" and "SALs"?**

“Background” is the concentration of each radionuclide or other contaminant that would be expected to be in the environment in the absence of LANL. Background concentrations in stream bed sediments are based on extensive sampling of many rivers and streams in northern New Mexico that are distant from LANL. Screening Action Levels (SAL) are also applicable to the sediment portion alone. These are levels were proposed by the LANL Environmental Restoration Project to determine when constituents are present at concentrations or activities at a level of concern and would indicate a need for additional samples to clarify. The SALs are set at levels less than what would be considered a human health risk.

**11. How do the levels measured fit in with what was seen before the Cerro Grande Fire?**

For several of the larger canyons draining the Laboratory there are many pre-fire sample results to compare post-fire runoff events against. Because of less than normal precipitation in the late 1990s, however, for some of the smaller streams there is limited data from before the fire. The average and maximum measured at the wetter sampling stations is indicated on the data table. These are based on data collected at each of these stations from 1995-1999. Although runoff data has been collected for much longer than that, the pre-1995 data was all collected manually. Manual samples are generally collected late in the flow event, because it takes some time for the sampling team to get to the flow when it starts raining. Therefore, manual samples do not include the first movement of water and sediments in the flow, known as the "first flush". The first flush generally contains the highest concentration of contaminants, so the manual samples generally do not include these potentially higher concentrations. Automated samplers, that begin sampling as soon as flow starts and continues to collect water on a specified time schedule, capture the full range of concentrations throughout the flow and provide a better indication of what is moving in the stormwater. The pre-1995 data are generally not used because the more recent data from the automated samplers provide a conservative basis to compare the post-fire results.

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Locations of Gaging Stations at LANL